Enhancing Yield Benefits from Intercropping of Pulse and Oilseed Crops

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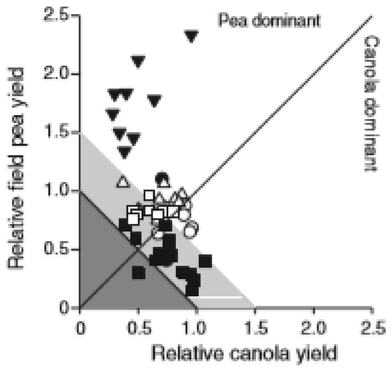
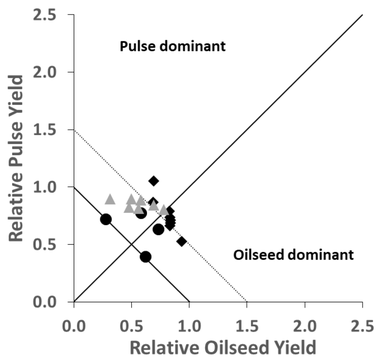
Introduction

Intercropping pulse and oilseed crops often increases overall crop productivity, but impact varies:



Australia

- Fletcher et al. 2016, Crop Past. Sci. 67: 1252-1267



Western Canada

- Cowell et al. 1989, Can. J. Soil Sci. 69:243-251
- Malhi 2012, Agr. Sci. 3:1023-1033
- Chalmers and Day 2009, MB Agron. Conf.

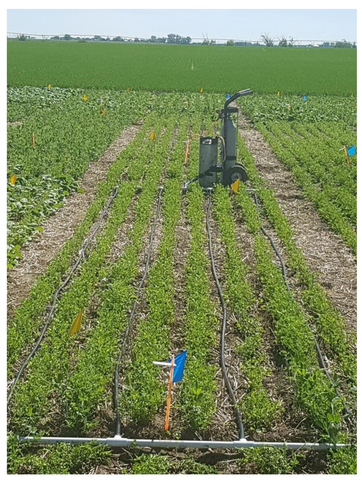
Materials & Methods

1. Crop system (main plots, 4 blocks)
   - Lentil monocrop
   - Pea monocrop
   - Oilseed monocrop (canola or yellow mustard)
   - Lentil-Oilseed intercrop
   - Pea-Oilseed intercrop

   (Intercropped pulse seeding rate = 75-100% of monocropped)

2. Subplot treatments
   - Check: 0 kg N/ha, intercropped oilseed seeding rate at 30% of monocropped
   - 50N#1: 50 kg N/ha just after seeding (^{15}N-labelled), same seeding rates as check
   - 50N#2: 50 kg N/ha in mid-June (^{15}N-labelled), same seeding rates as check
   - Low rate: 0 kg N/ha, intercropped oilseed seeding rate at 10% of monocropped
   - High rate: 0 kg N/ha, intercropped oilseed seeding rate at 75% of monocropped
   - 100N: 100 kg N/ha (monocrop oilseed only)

3. Sites
   - 2018: CR18 and LB18, oilseed=canola
   - 2019: LB19 and WS19, oilseed=mustard
   - LB-winter: winter pulse + spring canola



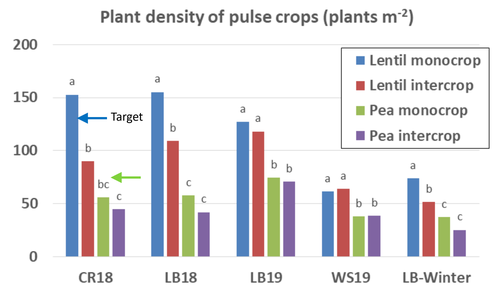
4. Land Equivalent Ratio (LER)
   - At same N rate (0 or 50 kg N/ha)
   - At standard N rate
     - 100 kg N/ha for oilseed monocrop
     - 0 kg N/ha for pulse monocrop

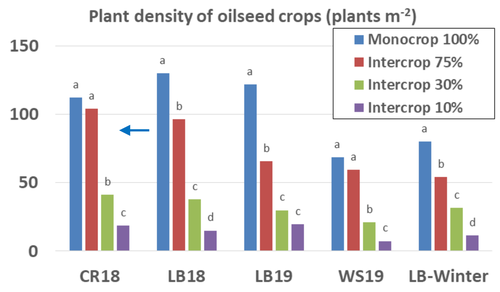
$$\text{LER} = \frac{\text{Intercrop yield}_{\text{Pulse}}}{\text{Monocrop yield}_{\text{Pulse}}} + \frac{\text{Intercrop yield}_{\text{Oilseed}}}{\text{Monocrop yield}_{\text{Oilseed}}}$$

Results

Plant Density

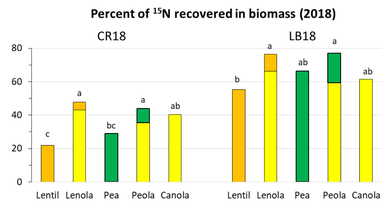
- Monocrop densities below target at WS19 and LB-Winter
- Pulse intercrop densities were 60 to 100% of monocrop densities
- Oilseed intercrop densities were 75, 32, and 14% of monocrop densities



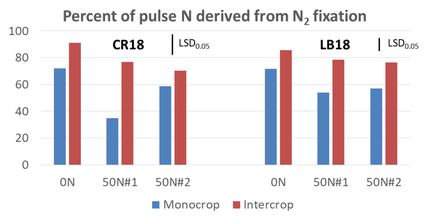


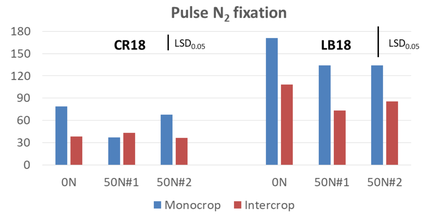
Nitrogen Dynamics (2018)

Intercropped canola strongly out-competed pulse crops for fertilizer N



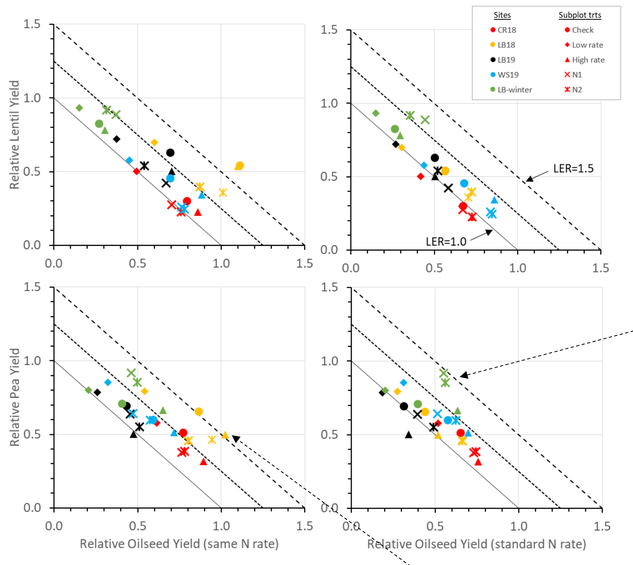
Intercropping increased pulse %Ndfa, but reduced N_2 fixation



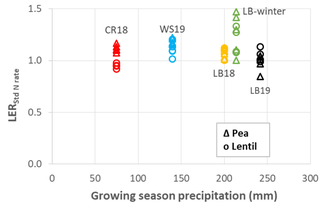


LER

- LER ranged from 0.98 to 1.66 using same N rates (mean = 1.20) and from 0.84 to 1.47 using standard N rates (mean = 1.10)

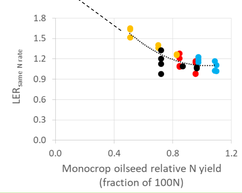


LER vs. precipitation



Addition of 50 kg N/ha increased LER at LB-winter (weedy site, poor stand)

- Increasing N sufficiency decreased $\text{LER}_{\text{sameN}}$ of spring crops



LER among subplot treatments*

Treatment	$\text{LER}_{\text{same N rate}}$	$\text{LER}_{\text{std N rate}}$
Check	1.31a	1.10a
50N#1	1.17b	1.08ab
50N#2	1.12b	1.08ab
Low rate	1.16b	1.03b
High rate	1.28a	1.05ab

*Excluding LB-winter.

Acknowledgements

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